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MONTHLY REPORT - MAY 1983
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MONTHLY REPORT - MAY 1983

STATUS OF PUBLICATIONS

Published

Botsford, L.W., R.D. Methot Jr., and W.E. Johnston. 1983. Effort dynamics of the northern California Dungeness crab (Cancer magister) fishery. Can. J. Fish. Aquat. Sci. 40(3):337-346.

Knowledge of the dynamic response of fishing effort to abundance is essential to a complete understanding of the cycles in catch in the northern California Dungeness crab fishery. In this fishery there is a lagged response of harvest rate to changes in abundance that is caused either by a time lag in fishermen entering and leaving the fishery following changes in abundance, a lag in market expansion and contraction following changes in abundance, or a combination of both. The time lag in this reponse appears to have decreased over the past 30 years. This lagged response is a potential cause of the cycles. However, neither of the two potential cyclic mechanisms examined here, a predator-prey mechanism (with man as the predator) and a price-dependent escapement mechanism (with price dependent on past catch), is a cause of these cycles. Although time-varying effort does not cause the cycles, it does have a substantial effect on the resulting catch record and population dynamics. If there is a density-dependent recruitment mechanism in this population as proposed earlier, the presence of this lagged response would cause the period of observed cycles to be longer than would be expected on the basis of population dynamics alone. Hence, previous estimates of the expected period of cycles from various population mechanisms are low. Removal of this response is a potential means of stabilizing this fishery.

THIS REPORT DOES NOT CONSTITUTE PUBLICATION AND IS FOR INFORMATION ONLY.

Botsford, L.W., R.D. Methot, Jr., and J.E. Wilen. 1983. Cyclic covariation in the California king salmon, Oncorhynchus tshawytscha, silver salmon, O. kisutch, and Dungeness crab, Cancer manister, fisheries. Fish. Bull., U.S. 80(4):791-802.

There are apparent cyclic fluctuations in the catch record of both northern and central California salmon fisheries. They are of the same period and strength as well known cycles in crab catch but of different phase. Statistical characteristics of this covariation, as reflected in estimates of auto and cross correlation functions, change following the decline of the central California Dungeness crab fishery. Analysis of a likely cause of this phenomenon, a greater delay in switching of effort from crab to salmon during years of high crab catch, indicates that this mechanism is not present. Phase differences between salmon and crab cycles imply constraints on remaining potential causes, but a cause of the cyclic covariation has not been established.

Lo, Nancy C.H. 1983. Sample size for estimating dolphin mortality associated with tuna fishery. J. Wildl. Manage. 47(2):413-421.

Dolphin (Stenella spp., Delphinus delphis) mortality caused by U.S. tuna purse seiners in the eastern tropical Pacific has been monitored under a quota system since 1976. A stratified ratio estimator (kill-per-day) has been used to measure the kill rate during the year. Vessel trips are stratified by fishing time period. The mortality data from 1976 through 1978 suggest a sample-size procedure based on the coefficient of variation rather than on the absolute variance of kill data. The sample size for each stratum is computed according to the desired precision of the stratum estimates rather than by allocation of a yearly sample size. The probability that the estimated mortality exceeds the quota, when in fact the quota is higher than the true mortality, is computed. This sample-size procedure is recommended for data that have a standard deviation proportional to the mean and the situation where the estimate within stratum is as important as the overall estimate.

Wetherall, Jerry A. 1982. Analysis of double-tagging experiments. Fish. Bull., U.S. 80(4):687-701.

Statistics arising from double-tagging experiments may be applied to estimate tag-shedding probabilities directly, to estimate parameters of underlying theoretical shedding models, or to estimate mortality rates free of tag-shedding bias.

Simple maximum likelihood estimators of tag retention rates, along with their asymptotic variances, may be derived assuming conditional multinomial sampling models. If specific models of shedding are of interest, limitations of existing theory may be

reduced by assuming the Type II shedding rate is time-dependent. In the more realistic models and their simpler precursors, parameters may be estimated by least squares or by maximum likelihood methods. Complications arising in the direct maximization of the conditional likelihood may be circumvented by use of iteratively reweighted Gauss-Newton algorithms available in standard statistical software packages. Simple diagnostic plots may be helpful in model selection.

When a sequence of double-tagged cohorts is released, recapture statistics may be treated separately or combined to estimate common shedding rates, but a more general linear model may be used to fully exploit the structure of the experiment and to estimate both common parameters and those unique to each cohort.

When recapture times are unknown but the experiment spans a sufficiently long period, the ratio of constant Type II tag-shedding rate to constant Type II total mortality rate may be estimated. Under similar circumstances, but with exact recapture times known for each fish, maximum likelihood estimates of both parameters may be computed.

If only the Type II mortality rate is of interest, it may be estimated free of tag-shedding bias by simple linear regression of appropriate double-tagging statistics, if Type II shedding and Type II mortality are constant during the experiment.

Approved by Center Director

MacCall, Alec and Reuben Lasker. New ideas on the fluctuations of the clupeoid stocks off California. For consideration for publication in Gilchristiana (South African Journal of Fisheries).

Myrick, Albert C., Jr., Edward W. Shallenberger, Ingrid Kang and David B. MacKay. Calibration of dental layers in seven captive Hawaiian spinner dolphins, Stenella longirostris, based on tetracycline labeling. For consideration for publication in Fishery Bulletin, U.S.

Squire, James L., Jr. Weight frequencies for striped marlin (Tetrapturus audax) caught off southern California. For consideration for publication in Marine Fisheries Review.

Administrative Reports

Wetherall, Jerry A. 1983. Assessment of the stock of green turtles nesting at East Island, French Frigate Shoals. SWFC Admin. Rep. H-83-8.

Translation

Nakamura, Hiroshi. 1935. Hemaphroditism observed in a skipjack tuna. Trans. Nat. Hist. Soc. Formosa 25(141):197-198. (Engl. transl. by Wilvan G. Van Campen, 1983, 3 p., Transl. No. 80; available Southwest Fish. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96812.)

HONOLULU LABORATORY

INSULAR RESOURCES INVESTIGATION

Second Northwestern Hawaiian Islands (NWHI) Symposium Held

Richard S. Shomura, Director, Honolulu Laboratory, reports that the second Northwestern Hawaiian Islands (NWHI) symposium entitled, "Resource Investigation in the Northwestern Hawaiian Islands," sponsored by the University of Hawaii Sea Grant College Program, the Southwest Fisheries Center Honolulu Laboratory, NMFS, the Hawaii Department of Land and Natural Resources, and the U.S. Fish and Wildlife Service, was held May 25-27 at the Campus Center Ballroom, University of Hawaii at Manoa. The objectives of the symposium were to review major results of the 5-year research program, discuss the development and management of major fisheries, and to discuss management options of the major living resources in the NWHI.

Included in the symposium agenda was a 30-minute film, "The Nortwestern Hawaiian Islands--A Study in Resources and Ecology," which described the cooperative NWHI research. Honolulu Laboratory personnel Dr. Jeffrey J. Polovina, Mathematical Statistician, and Reginald M. Gooding, Fishery Biologist, provided a major contribution to the production of the film.

The agenda also included the following presentations by Honolulu Laboratory personnel: "The Hawaiian monk seal: A synopsis of research" by John R. Henderson, Fishery Biologist; "Population status and ecology of the green turtle" by George H. Balazs, Fishery Biologist; "Population biology and management of spiny lobsters in the NWHI" by Richard N. Uchida, Fishery Biologist; "Population biology and management of snappers and groupers in the NWHI" by Dr. Stephen Ralston and James H. Uchiyama, Fishery Biologists; "Seamount fishery resources in the NWHI" by Research Assistant Robert L. Humphreys, Jr.; "Pelagic fishery resources of the NWHI" by Thomas S. Hida, Fishery Biologist; and "Tropical ecosystem biomass budget model and its application to the NWHI" by Dr. Jeffrey J. Polovina, Mathematical Statistician. Richard S. Shomura gave an introductory speech to begin the formal presentations on the opening day of the symposium, and also was a panelist on an "optimum use scenarios" panel.

NOAA Administrator and Assistant Administrator for Fisheries Participate in NWHI Symposium

Dr. John V. Byrne, Administrator, and William G. Gordon, Assistant Administrator for Fisheries, NOAA, were participants in the NWHI symposium held on May 25-27 at the University of Hawaii. Dr. Byrne was the invited speaker at the luncheon on May 25 and William G. Gordon participated in the panel discussions on the final day of the symposium.

In his speech Dr. Byrne mentioned the importance of examining linkages to understand fishery resources and their response to the environment. These linkages include the use of knowledge gained in other disciplines to provide answers or solutions to problems in one's own research. As an example, he mentioned the work of Dr. Victor Springer who used new concepts in Pacific plate tectonics to explain the distribution and endemism observed in Pacific shorefishes.

In addition to participating in the symposium and visiting the Honolulu Laboratory facilities, Dr. Byrne also visited some of the other NOAA agencies in Hawaii. Dr. Byrne was honored at an informal dinner gathering sponsored by the Honolulu Laboratory Employees Association at the Kewalo Research Facility on May 26. The function was attended by over 200 NOAA employees and guests. (Please see photos of this event on following page).

Manuscripts Completed on Results of NWHI Research

Richard N. Uchida, Leader, Insular Ecosystem Program, reports that Honolulu Laboratory researchers completed the following manuscripts which will be submitted for publication in the proceedings of the NWHI symposium:

Spawning and gonadal maturation of the ehu, Etelis carbunculus, in the Northwestern Hawaiian Islands by A.R. Everson.

Distribution and relative abundance of the caridean shrimps, Heterocarpus ensifer and H. laevigatus, in the Northwestern Hawaiian Islands by R.M. Gooding.

Seamount fishery resources within the southern Emperor-northern Hawaiian Ridge by R.L. Humphreys, Jr., D.T. Tagami, and M.P. Seki.

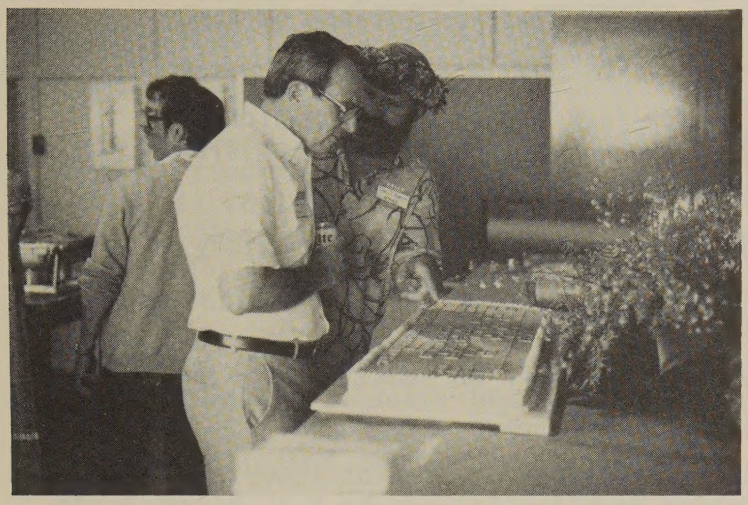
Ciguatera and the feeding habits of the greater amberjack, Seriola dumerili, in the Hawaiian Archipelago by R.L. Humphreys, Jr., and S.H. Kramer.

Maturation, spawning, and fecundity of opalapaka, Pristipomoides filamentosus, in the Northwestern Hawaiian Islands by B.S. Kikkawa.

Gonadal maturation, fecundity, and spawning of the greater amberjack, Seriola dumerili (Risso), in Hawaiian waters with reference to the occurrence of ciguatoxic fish by B.S. Kikkawa and A.R. Everson.

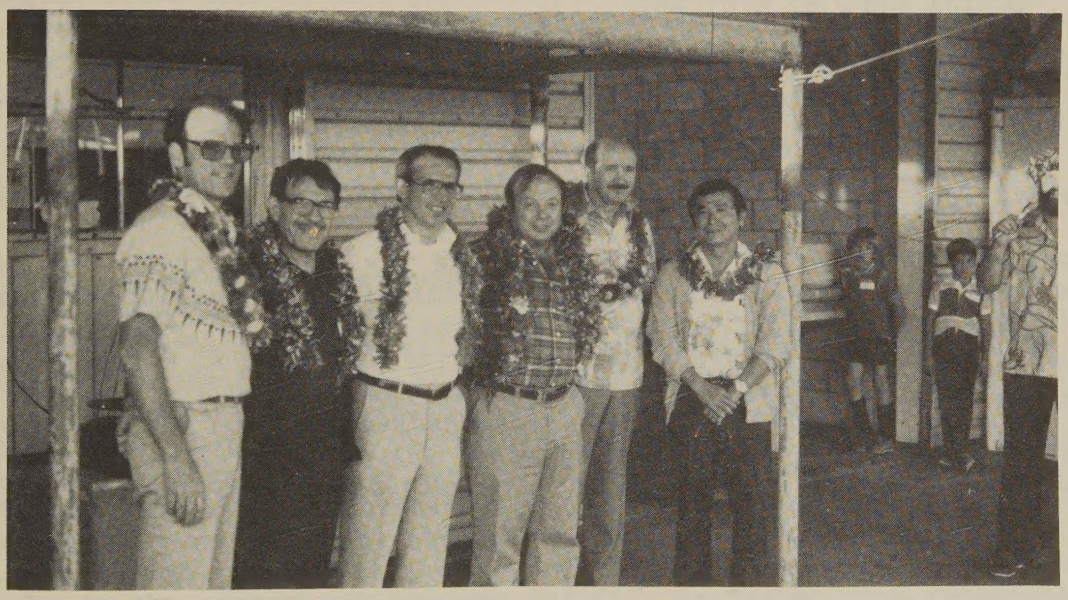
The food and feeding habits of the white trevally, Pseudocaranx dentex (Bloch and Schneider 1801), in the Northwestern Hawaiian Islands by M.P. Seki.

The food and feeding habits of the grouper, Epinephelus quernus Seale 1903, in the Northwestern Hawaiian Islands by M.P. Seki.



David Hamm is showing the specially baked NOAA cake to John Byrne. The cake was baked by Mrs. Hamm. Richard Shomura and Izadore Barrett can be seen in the background.

Dr. John V. Byrne speaking to the gathering at the "clambake" sponsored by the Honolulu Laboratory's employee's association.



Gary Smith, Iz Barrett, John Byrne, Bill Gordon, John Carr, and Richard Shomura pose for a group picture. MC Dave Hamm can be seen in the extreme right.

Biology, distribution, population structure, and pre-exploitation abundance of spiny lobster, Panulirus marginatus (Quoy and Gaimard 1925), in the Northwestern Hawaiian Islands by R.N. Uchida and D. T. Tagami.

Length-weight and standard length-fork length relationships of deep-sea handline fishes of the Northwestern Hawaiian Islands by J.H. Uchiyama, S.H. Kuba, and D.T. Tagami.

Distribution, apparent abundance, an overview of life history research on the bottom fish species in the Northwestern Hawaiian Islands by J.H. Uchiyama and D.T. Tagami.

In addition, the following manuscripts will be submitted for publication in other journals:

Fecundity of the spiny lobster, Panulirus marginatus (Quoy and Gaimard), in the Northwestern Hawaiian Islands by V.A. Honda.

Food and feeding habits of the wahoo, Acanathocybium solandri, in Northwestern Hawaiian Islands by S.H. Kramer.

Determination of size at maturity in the Hawaiian spiny lobster, Panulirus marginatus, from changes in relative growth by J.H. Prescott.

Current trends in Hawaiian fisheries by P.M. Shiota and R.N. Uchida.

Fishery atlas of the Northwestern Hawaiian Islands by R.N. Uchida and J.H. Uchiyama.

Groundfish fisheries and research in the vicinity of seamounts in the North Pacific Ocean by R.N. Uchida and D.T. Tagami.

Daily Growth Increments on Mahimahi Otoliths Validated

James H. Uchiyama and research associate Ray King Burch of the Wakiki Aquarium worked on the validation of mahimahi, Coryphaena hippurus and C. equiselis, daily growth increments. Specimens were raised from eggs at the Wakiki Aquarium and the Kewalo Research Facility by Thomas K. Kazama, Fishery Biologist, Sharon D. Hendrix, University of Hawaii graduate student, and Burch. Otoliths from 10 C. hippurus specimens ranging from 4 to 191 days in age and 13 C. equiselis specimens ranging from 1 to 63 days in age were examined. The counts of daily growth increments differed by two of the known age.

FISHERY MANAGEMENT RESEARCH PROGRAM

Various Tasks Occupy Researchers in the Fishery Management Research Program

Thomas S. Hida, Acting Leader, Fishery Management Research Program (FMRP), reports that researchers in FMRP were engaged in various tasks. Samuel G. Pooley, Industry Economist; Ray F. Sumida, Fishery Biologist; and David C. Hamm, Computer Systems Analyst, prepared data summaries and various reports for the Western Pacific Regional Fishery Management Council (Council) meetings held on May 23 and 24. Research assistant Bernard M. Ito and Sumida spent time at the waterfront collecting spiny lobster catch data and monitoring the activities of the albacore trolling boats. They placed logbooks on the albacore boats and also supplied XBT's to those vessels under contract with the SWFC. Research assistants Victor A. Honda and Bert S. Kikkawa collected data from the Hawaiian longline and pole-and-line fishing vessels.

PELAGIC RESOURCES INVESTIGATION

Tuna Behavior Research Results Reported at Tuna Conference

Dr. Richard W. Brill, Leader, Experimental Ecology of Tunas Program, reports that 7 of the 19 papers presented at the Lake Arrowhead Tuna Conference were based on work done at the Honolulu Laboratory's Kewalo Research Facility. Dr. Brill presented a paper on the current and future research activities on tuna physiology, energetics, and behavior at the Kewalo Research Facility. Other papers presented were on tuna's response to natural and artificial prey odors by Dr. Kim Holland, Hawaii Institute of Marine Biology, University of Hawaii; the magnetic compass sense of tuna by Michael M. Walker, University of Hawaii graduate student; acid base regulation in tuna by Dr. Charles Daxboeck, Pacific Gamefish Foundation; and tuna swimming energetics by Chris Boggs, Univeristy of Wisconsin graduate student.

Stock Assessment of Green Turtles Completed

Dr. Jerry A. Wetherall, Leader, Pelagic Stock Assessment Program, completed an administrative report outlining the results of a stock assessment of green sea turtles, Chelonia mydas, meeting at East Island, French Frigate Shoals. Dr. Wetherall's analysis is based on data gathered at East Island from 1973 through 1982 by George H. Balazs, Fishery Biologist. Computing assistance was provided by Mathematician Marian Y.Y. Yong. The analysis was designed to provide background information for a review of the status of the Hawaiian green turtle stock, which, along with several other green sea turtle stocks in the central and western Pacific, is listed as a threatened species under provisions of the Endangered Species Act.

New statistical models and estimation procedures were developed for the turtle stock assessment. These are based on detailed observations of turtle residence patterns at East Island, and on the resighting of tagged turtles.

The analysis resulted in estimates of the size of the stock of mature females nesting at East Island, the fraction of this breeding stock expected to be nesting in any year, and the average annual recruitment of neophyte nesters.

The average size of the nesting population during 1973-82 was 144 turtles. There was an upward trend in the nesting population, but this was statistically nonsignificant. Annual recruitment to the mature female stock was estimated to be between 30 and 72 turtles, depending on the assumed adult female survival rate. The corresponding range in the estimated average total stock of mature females at East Island was from 397 to 358 turtles. The total mature female stock for the entire Hawaiian Archipelago is probably on the order of 1,000 turtles.

Assessment of the turtle stock is complicated by the confounding of survival rate and remigration probabilities in some estimation models, and by the confounding of recruitment and survival rate in others. Until these problems can be overcome, either by development of better estimators or by expansion of field research programs to collect ancillary data, only conditional assessments will be possible.

The green turtle assessment models and results will be published in a scientific journal, and additional analyses will be attempted based on observations of basking male and female turtles.

Hawaii Landings of Skipjack Tuna Below Long-Term Average

The May 1983, Hawaii landings of skipjack tuna were estimated at 46 metric tons (MT), which is 96 MT below the May 1982 landings and 430 MT below the 1964-80 long-term average for May. The cumulative landings from January through May were estimated at 184 MT which is 176 MT below the 1982 landings for the same period and 880 MT below the 1964-80 long-term average for the same period (Figure 1).

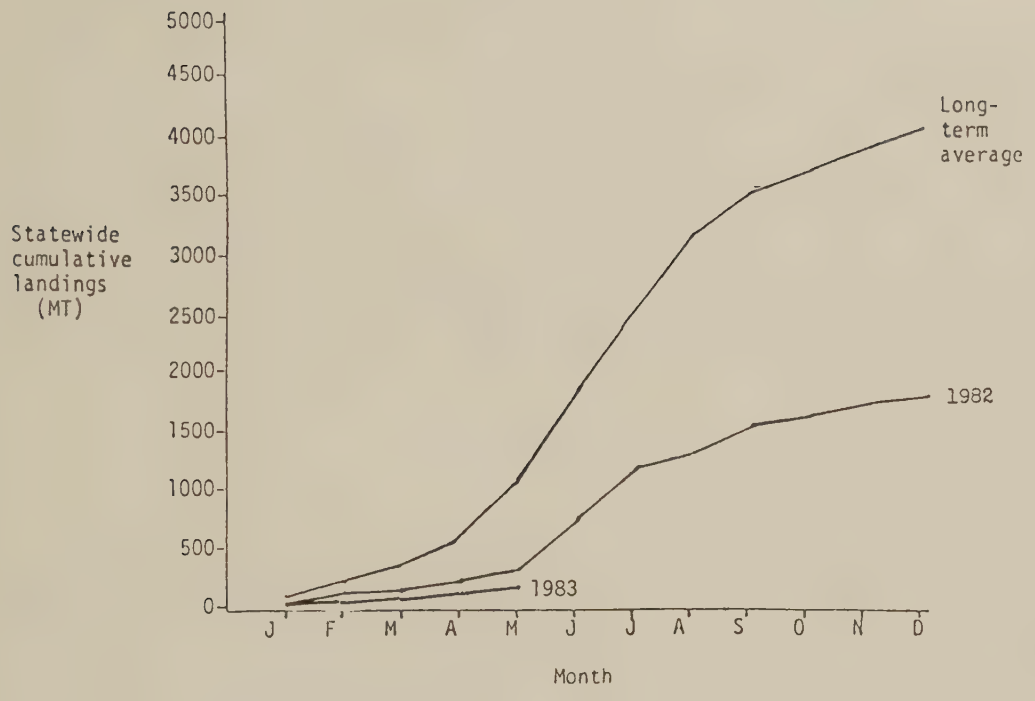


Figure 1. Cumulative landings in the Hawaiian skipjack tuna fishery.

LA JOLLA LABORATORY

Coastal Fisheries Resources Division

COMMERCIAL AND RECREATIONAL FISHERY RESEARCH MANAGEMENT

Working Group Report Completed as Result of FAO "Expert Consultation"

Fishery Biologist Alec MacCall completed a working group report entitled "Resources Study and Monitoring" which resulted from the Expert Consultation to Examine Changes in Abundance and Species Composition of Neritic Fish Stocks, held in San Jose, Costa Rica, April 18-29, 1983. The report will be published late in 1983, by the Food and Agriculture Organization of the United Nations, together with three other working group reports (respectively on the subjects of physical study and monitoring, societal effects, and management).

Second Draft of Revised Anchovy Plan Presented to Pacific Council

The second draft Revised Anchovy Plan was presented to the Pacific Fishery Management Council and its review committees in early May, according to Dr. Dan Huppert, Task Leader. The Plan Development Team received two previously solicited independent outside reviews of an earlier draft of the Anchovy Plan. The Council decided to postpone plan action for 2 months while the issues raised by the various reviewers could be investigated by the team. The PFMC now intends to consider release of the draft plan for the public review process at its July meeting in Los Angeles.

In response to the reviewers' comments, the anchovy team reexamined the data and productivity estimates. Dr. Richard Methot revised the analysis of anchovy biomasses and age compositions. One major change was clarification of the calibration of various indices to the egg production method of estimating spawning biomass. Another change concerned the possibility that the egg production method underestimated spawning biomass in April 1981. Based on the revised abundance estimates, MacCall recalculated the anchovy productivity based on the stock-stock model and a new treatment of the effects of observation errors. The new model shows the resource to be more productive with maximum productivity occurring at a higher level of abundance than previously estimated. The expected performance of various optional harvest quota formulas was investigated by computer simulations based on the newly revised anchovy population model.

Work Continues on 1983 Biomass Estimate of the Northern Anchovy

Susan Picquelle, Statistician, analyzed the anchovy egg data set from the 8302 CalCOFI cruise, which was provided to her by Richard Charter, Data Manager. The result of this analysis is the egg production parameter for the "egg production" estimate of the anchovy spawning biomass. Picquelle assigned ages to each egg collected based on its stage of development, time of collection and water temperature, using a growth model developed by John Hunter, Fishery Biologist, and James Zweifel, Statistician at the Southeast Fisheries Center. She then assigned each egg station to one of two strata using post-survey stratification--stratum 0 is beyond the range of anchovy eggs, and stratum 1 is within the range and contains all the positive tows. Each station was also given a weight based on the relative size of area that the station represents.

Picquelle then fit a mortality function to the aged egg data for stratum 1 by regressing egg abundance on age using a weighted-non-linear regression program in BMDP. The 0-intercept of the regression is the daily production of eggs per unit area (P_0) and the slope is the daily rate of instantaneous mortality (z). The estimate of P_0, averaged over both strata, is 5.55 eggs per 0.05 m^2 with an estimated mortality rate of 0.184. The total production of eggs over the survey area is P_0 multiplied by area 1.73 x 10.13.

Picquelle also worked on the anchovy trawl data which provides the rest of the parameters for the egg production estimate--mature female weight, sex ratio, batch fecundity, and spawning fraction. Picquelle is the data manager for this data base, thus she supervised the data entry and edited the data. A subset of this data base is used to estimate the relationship between batch fecundity and ovary-free weight. Editing of this data set was completed and the relationship was estimated by regressing the number of eggs per batch on ovary-free weight for those females which contain hydrated eggs about to be spawned. This regresison is $E = -942 + 582W$, where E is the number of eggs per batch and W is the ovary-free weight.

Rockfish Growth Research Continues

John MacGregor, Fishery Biologist, has continued his routine scale reading and processing of data for several species of rockfish. All species continue to show a non-random distribution of deviations of observed lengths at age from calculated lengths. A von Bertalanffy growth curve calculated for 10 speckled rockfish (Sebastes ovalis) ranging in age from 1 to 14 years showed a negative deviation at age 1, positive deviations at ages 2 through 5, negative deviations at ages 6 through 11, and positive deviations ages 12 through 14.

Curves calculated for each of the 10 fish showed approximately the same pattern indicating that the von Bertalanffy curve does not quite fit rockfish growth. Ten species of rockfish from the Monterey area treated by Phillips (1964) also show this pattern of deviations. It was earlier suspected that

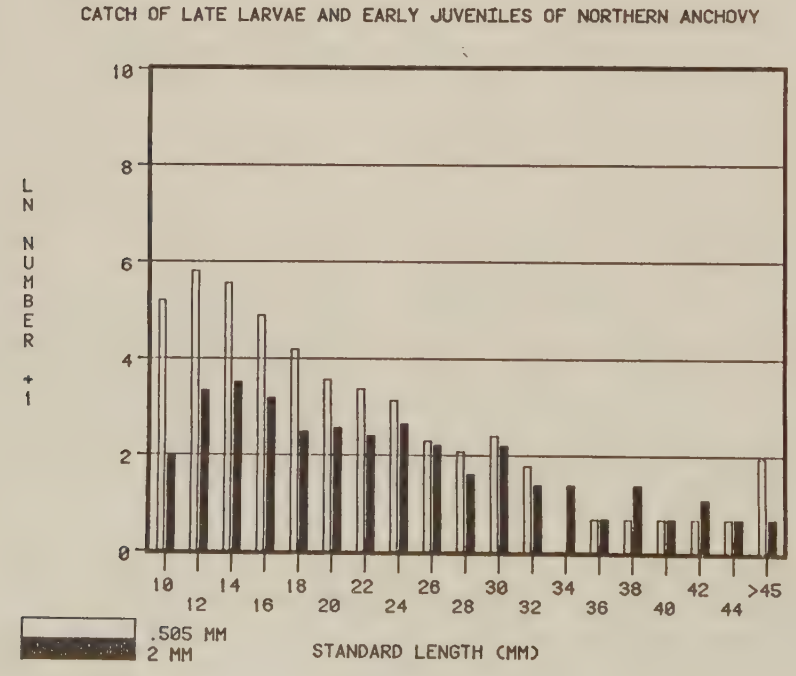
the pattern of deviations might be an artifact created by combining fish with different growth rates, but it now appears that the pattern is characteristic of the individual fish.

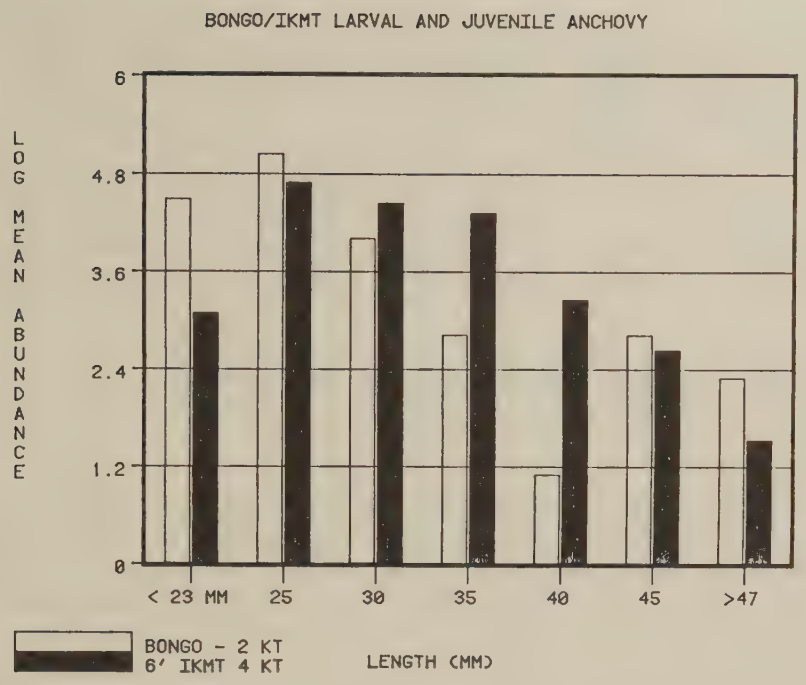
New Isaacs-Kidd Juvenile Fish Trawl Designed

Fishery biologists Dr. Rick Methot and Dr. Paul Smith report that for the past 6 months one important objective of the staff of the Coastal Division has been to define a sampling procedure for quantitative estimates of juvenile pelagic fish. During the May cruise of the Jordan sets of paired samples were obtained from which it was possible to establish the following sampler characteristics for late larval and early juvenile anchovy to aid in design of the sampling gear.

Mesh size.--The mesh size was chosen to be 3 mm from the data in Figure 1. Here it can be seen that the retention of 2 mm mesh is virtually complete by the time that the larva is 25 mm long. From this we reason that the 3 mm mesh will retain juveniles completely at the time of metamorphosis (37-40 mm) and also retain considerable numbers down to 21 mm.

Mouth area.--Mouth area in the new trawl was chosen to be 10 square meters. The current Isaacs-Kidd Midwater Trawl with a 2.8 m^2 at 3 knots was capturing fewer than 10 specimens of metamorphosed anchovy juveniles per 2,000 m^3 tow. By increasing the mouth area to 10 m^2 from 2.8 m^2 the catch under the same conditions would be about 30 specimens of metamorphosed juveniles per sample (Figure 2). We expect the size range captured will be 35 mm to 70 mm which overlaps the lower size limit of the 200 m^2 midwater trawl.





Towing speed in the new fish trawl should be 4 knots or greater. The amount of mesh in the net will provide 3.5 units of mesh open area per unit of mouth area. For example, if the mesh is 50% open a 10 m^2 mouth will require 35 m^2 of aperture or 70 m^2 of mesh material. An experimental bridle will be evaluated to improve capture efficiency. Skids will be put on the outboard edges of the depressor so that contact with the bottom can be a normal part of the oblique tow in water less than 100 meters.

Documents on Early Life Histories of Fish in Preparation

Dr. Hunter reports he attended a workshop on the Interannual Variability of the Environment and Fisheries of the Gulf of Alaska and the Eastern Bering Sea, at Lake Wilderness, Washington (May 16-18) and has prepared a report which is a short commentary on Dr. Warren Wooster's review of recruitment variability which will be published in a University of Washington (Sea Grant) volume this year.

Dr. Hunter also wrote a preliminary proposal for studying recruitment variability of demersal fishes after consultation and advice from members of the Coastal Division staff, D. Huppert, G. Moser and M. Laurs. The proposal has been subsequently reviewed by Tiburon scientific staff and their comments incorporated.

Dr. Hunter prepared a first draft of a MS entitled "Inferences regarding predation on the early life stages of cod and other fishes," for a meeting to be held on Cod Biology in Arendal, Norway, June 13-17. In the MS he reviews the literature on the predators of the early life stages of marine fishes and suggests possible research approaches.

Dr. Hunter also reports that a MS entitled, "The visual feeding threshold and action spectrum of northern anchovy (Engraulis mordax) larvae" by Teodora Bargarinao and John Hunter was accepted for publication in CalCOFI Reports for publication in the 1983 edition of the reports. The report gives the visual action spectrum for feeding of anchovy larvae 10-1 mm, and provides an estimate of the irradiance at which 50% reduction in feeding occurs. The paper indicates the time, day, depth, and irradiation level in the sea at which anchovy larvae of this size are able to feed. The work was a part of a MS thesis written by Ms. Bargarinao at UCSD under Dr. Hunter's supervision.

Work Begins on Calibration of Various Growth Indices to be Used in Studies of Reproductive Effort of Anchovy Populations

Dr. John Hunter reports that fishery biologist Carol Kimbrell has worked out the procedures for determination of the RNA/DNA ratio of anchovy white muscle. This index of somatic growth will be used along with growth of the outer edge of the otolith (an index of skeletal growth) to study the growth process of anchovy in the sea and in particular to investigate the factors regulating the partitioning of energy among reproduction, energy storage and growth in natural populations of anchovy.

John Butler, Fishery Biologist, is responsible for calibrating the otolith growth with skeletal growth and Bev Macewicz, Biologist, has the responsibility for staging the ovaries of wild stock to determine their reproductive state. It now is possible, using criteria developed by Macewicz, to determine from ovarian histology not only if a female has spawned recently but also to estimate the amount of time elapsed since the ovary was last active in females with regressing ovaries. The first step in this work is to calibrate two growth indices in the laboratory and this work has just begun. After this is completed, reproductively staged females taken in the spring and winter of 1983 will be analyzed using these two growth indices and an estimate of total fat and protein storage.

These measurements (otolith growth, reproductive stage, RNA/DNA ratio, fat and protein content) will make it possible to determine the size specific factors regulating the cessation of spawning in anchovy and the duration of the spawning season. This is of considerable importance, as the duration of the spawning season is the major factor in regulating the size specific annual reproductive effort of the population and probably plays a major role in recruitment processes.

Sampling Scheme Under Development for Sablefish

Dr. Nancy Lo, Mathematician, is developing a sampling scheme for commercial catches of sablefish in central and northern California, requested by Southwest Region in Terminal Island. This sample scheme is designed to estimate the catch of sablefish under 22 inches, which will be used to enforce the new regulations on groundfish species. Lo has written to California Fish and Game in Menlo Park for the existing data on size distributions and the landing figures of sablefish, before optimal sample sizes can be determined.

Oceanic Fisheries Resources Division

TUNA AND BILLFISH RESOURCES PROGRAM

SPC's Loss is SWFC's Gain

Dr. Pierre Kleiber, formerly of the South Pacific Commission, Noumea, New Caledonia, joined the Southwest Fisheries Center's Oceanic Resources Division on April 11 (Please note photo on page 42.) Dr. Kleiber had been working as a senior fisheries scientist for the Skipjack Program, which is a large-scale tuna tagging project in the western and central Pacific Ocean. He was responsible for the analysis of tag returns and evaluation of biochemical genetic data to investigate mortality rate, harvest rate, stock size and migratory schooling behavior of skipjack. The main goal of the program was to investigate the degree of interaction among the various tuna fisheries in the region.

Dr. Kleiber received his B.A. from Harvard in 1966 in biochemical sciences and his Ph.D. from U.C. Davis in 1972 in Zoology. He received post-doctoral training at the Institute of Ecology and Genetics at Aarhus University in Denmark and at the Institute of Animal Resource Ecology at the University of British Columbia. He joined the South Pacific Commission in 1978.

At the SWFC, Dr. Kleiber will direct the North Pacific Albacore Simulation Modeling Investigation.

Three Methods Evaluated for Purification of Marine Fish mtDNA

In order to use mtDNA as a tool for measuring genetic relatedness of individuals and stocks, it is necessary to either purify mtDNA (1%) from the nuclear DNA (99%) directly or resort to a more complicated method which enables visualization of the mtDNA against a background of nuclear DNA. The disadvantage of the former method is that it requires very fresh specimens. However, the latter method requires that some purified mtDNA be used to act as a hybridization probe to bond with the sample mtDNA. The probe mtDNA can be from a closely related form. For instance, for the tuna investigations, Drs. A. Dizon, and John Graves intend to use hybridization probes from Pacific mackerel mtDNA.

Extraction of marine fish mtDNA, however, is proving to be difficult, according to Dizon. For some reason, the mtDNA from these fish seems more fragile than its mammalian counterpart; established techniques for separating mtDNA from the nuclear DNA rely on the mtDNA maintaining its "supercoiled" conformation. Apparently nucleases within the fish's cell "nick" the mtDNA, causing it to relax, or in some cases break it down into low molecular weight fragments. Whatever the cause, conventional cesium chloride purification techniques do not seem to work consistently.

Fortunately, three new techniques, recently developed in other laboratories, are available and are currently being evaluated by Dizon and Graves. The three techniques, two of which are said to work with marine fish, have the advantages of not requiring ultracentrifugation.

Manuscripts Submitted for the International Skipjack Year Program

Drs. David Au, Andrew Dizon, John Graves, Pierre Kleiber, and Gary Sakagawa of the Southwest Fisheries Center will travel to Tenerife in the Canary Islands to present papers and participate in a "wrap-up" conference, June 20-30, 1983, for the International Skipjack Year Program sponsored by the International Commission for the Conservation of Atlantic Tunas (ICCAT). Dr. Au will present a paper, "The spawning schedule of skipjack tuna from southeastern Brazil as determined from histological examination of ovaries, with notes on spawning in the Caribbean," authored by himself and Dr. Stephen R. Goldberg. The manuscript describes work in which a total of 996 skipjack tuna ovaries (961 from Brazil and 35 from the Caribbean) were examined to determine their reproductive condition. Brazilian fish were sampled from November 1981 to July 1982 from the coastal area south of Cabo Frio between 22° and 28° latitude. Caribbean samples were obtained during June, August, and September 1981. A portion of the Brazilian population was in spawning condition in November and this condition continued through March. Ovaries obtained during May-July were regressed. Minimum length of sexually mature females was 510 mm and the minimum gonad index of spawning fish was 30. Skipjack are multiple batch spawners and histologically mature ovaries represent a wide range of gonad indexes, including ripening and recently spawned conditions.

Regression analyses revealed significant positive correlations between egg number and body length, body weight, and ovary weight. For skipjack tuna measuring 510-720 mm fork length and 2600-9650 g body weight, the average fecundity was estimated at 385,937 $\pm$ 75,169 eggs.

Dr. Au will also ask the question, "Are skipjack tuna population dynamics quantitatively different from that of other tropical tunas?" in a paper which he authored. The manuscript compares population features of skipjack, yellowfin, and bigeye tunas and seeks an explanation for the erratic nature of skipjack catch statistics. The most notable feature of skipjack appears to be its wide-ranging behavior. This is related to a feeding strategy evolved to efficiently exploit an oceanic environment characterized by relatively low productivity. The high activity levels are associated with higher metabolic rates, higher natural mortality rates, and higher growth rates, and an earlier age of reproductive maturity, relative to the other tunas. The resulting production/biomass ratio is high and the age structure simple, so that recruitment success and movement-related availability of cohorts dominate the catches. At the same time the widespread population of adults tends to protect the stocks from recruitment overfishing.

Dr. Andrew Dizon will present a manuscript authored by Lisa Ankenbrandt, Biological Aid, titled, "Food habits of bait-caught skipjack tuna from the southwestern Atlantic Ocean." The paper describes the analysis of food habits

from 1041 adult skipjack tuna caught off southern Brazil. Ankenbrandt was particularly interested in whether juvenile skipjack tuna were utilized as forage. Changes in diet were also examined by season and by size of the predator.

No juvenile skipjack tuna were found in any of the stomach contents. While Auxis thazard and Scomber japonicus represented the major scombrid prey items, Euphausia similas and Maurolicus meuellei provided the bulk of the diet items throughout the entire season and size range of the sample.

Dr. John Graves will present, "The mitochondrial DNA genetic structure of skipjack tuna populations and its management implications" by Graves and Dizon. The investigators used restriction enzyme analysis of mitochondrial DNA (mtDNA) to determine the genetic basis of the population structure of skipjack tuna from the eastern and western Atlantic and Pacific Oceans. No significant genetic differentiation was detected between fish from different ocean basin although sufficient within-sample variation was detected. These results are consistent with the lack of morphological and electrophoretic differentiation found in previous studies and strongly suggest a sufficient gene flow between ocean basins exists to prevent genetic differentiation. Although the probability of any particular skipjack tuna school interchanging or even crossing ocean basins is probably small, management decisions must be made which consider such genetic evidence.

Dr. Gary Sakagawa will be describing, "Some recent changes in the Atlantic skipjack tuna fisheries" in a paper authored by himself and Atilio Coan, Statistician, ICCAT's International Skipjack Year Program (ISYP) was instrumental in drawing attention to the presence of the underutilized resource of skipjack tuna in the Atlantic Ocean and in encouraging increased exploration and exploitation of the resource. Fisheries statistics for the period before 1979 and after 1978, when the 4 year ISYP was in effect, demonstrate that the fisheries for skipjack tuna have undergone expansion and changes. The Atlantic catch of skipjack tuna, for example, increased from an average of 91,300 metric tons in 1975-78 to an average of 118,300 metric tons in 1979-82.

Dr. Sakagawa will also discuss the "skipjack fisheries in the western Atlantic." Fishery information on skipjack tuna in the western Atlantic Ocean shows that the fish are caught throughout the area on a range of gear types from the artisanal to the advanced. Areas in the Gulf of Mexico, Caribbean Sea, and off northeastern and southeastern Brazil appear promising for further skipjack fishery development. It appears that production from the region will not increase appreciably in the near-term without employment of more efficient methods for locating schools or for catching available schools. Sakagawa suggests fish aggregating devices as a possible technique for concentrating schools and catching them more efficiently.

Status of Atlantic Tuna Fishery Sampling Program

Foreign-caught Atlantic tunas transshipped to Puerto Rico are sampled routinely for biological information by Biological Technician Eugene Holzapfel. Data on fork length, weight, and species composition of catches are collected. Results of Holzapfel's sampling during the period January 1, 1983 to May 31, 1983 are as follows:

Species and gear	# of samples	# of fish sampled	Tonnage sampled (MT)
Yellowfin			
Purse seine	1	70	45.2
Unknown	2	141	25.4
Skipjack			
Baitboat	2	100	119.2
Purse seine	1	50	301.4
Bigeye			
Purse seine	1	30	21.9

Albacore Model Modified

Progress in the albacore modeling project has been slowed by problems in accessing the Northwest Fisheries Center's (NWFC) computer system, in Seattle, Washington, where the albacore model is currently implemented. Problems relate to the poor quality and slow speed (300 baud) of the transmission line between the two Centers, to the fact that the NWFC computer is heavily used, and that there is no adequate system for preparing graphical output at the SWFC in La Jolla from files stored on the NWFC computer.

In spite of these problems, however, development of the model has continued. The migration structure of the model is being "tuned" so that the fish appear to migrate in the expected directions at the expected seasons and at the expected fish ages. As a result none of the geographical sectors show unexpected accumulations of depletions of stock. In addition, a new form of output from the model has been implemented whereby the apparent catchability in each time/space/age/gear sector is calculated from the known catch, the known effort, and the population at large predicted by the model. The frequency distributions of apparent catchability for all age and gear types are prepared. In this way a sector in which the model is performing poorly is indicated by an apparent catchability that is different from most of the other apparent catchabilities for the particular age and gear type. This method is an alternative to the normal method of judging the performance of the model in which the catch predicted by the model for each time/space/age/gear sector is compared with the observed catch for that sector.

Because of the difficulties mentioned above in utilizing the NWFC computer and because of the high cost of maintaining files at that facility, a decision has been made to continue further work on a local, in-house microcomputer. To that end, a form of the albacore model is being implemented on one of the La Jolla standards in order to assess the feasibility of carrying on the albacore modeling effort on a small system and to determine what enhancements to the La Jolla standard will be necessary and appropriate to make a micro an efficient alternative to the use of a main frame computer.

1983 Cumulative U.S. Tuna Receipts Tallied

According to Dr. Sam Herrick, Industry Economist, landings data compiled by the Market News Service of the National Marine Fisheries Service's Southwest Region, indicate that overall U.S. receipts of albacore, bigeye, skipjack and yellowfin tuna through March 31, 1983, are down 6% compared to the same period during 1982. Cumulative 1983 albacore and yellowfin tuna receipts (imports plus domestically-caught fish) have declined 26% and 25% respectively from 1982, while bigeye tuna receipts have increased 124%, and skipjack tuna receipts are up 18% from 1982. Reported quantities of imports and domestically-caught tuna received at major U.S. landings sites through March 31, 1982 and 1983 are presented in the accompanying table.

U.S. Tuna receipts by species, site and source,
January 1 - March 31, 1982 and 1983.

Species	Site[1]	Source[2]	Quantity 1982 (S. Tons)	Quantity 1983 (S. Tons)	Per. chg. 1982-83
Albacore	PR	I	10079.2280	10453.9620	3
Albacore	PR	D	0.0000	4.3955	100
Albacore	AH	I	7828.1720	5806.0955	- 25
Albacore	CN	I	4432.0000	332.0000	- 92
Albacore	CN	D	42.0000	59.0000	40
Subtotal			22381.4000	16655.4530	- 26
Bigeye	PR	I	41.2080	727.8280	1666
Bigeye	PR	D	0.0000	594.6410	100
Bigeye	AH	I	906.0480	796.1803	- 12
Subtotal			947.2560	2118.6493	124
Skipjack	PR	I	20902.0730	21016.5639	0
Skipjack	PR	D	1210.2670	2361.7445	95
Skipjack	AH	I	1152.7510	2487.1360	115
Skipjack	AH	D	5752.3080	7501.3700	30
Skipjack	CN	I	5856.0000	7261.0000	23
Skipjack	CN	D	8769.0000	11022.0000	25
Subtotal			43642.3990	51649.8144	18
Yellowfin	PR	I	9197.5615	4687.4472	- 49
Yellowfin	PR	D	4055.9935	5325.6140	31
Yellowfin	AH	I	1262.1600	780.6430	- 38

Yellowfin	AH	D	3232.9300	3205.1258	0
Yellowfin	CN	I	1523.0000	1056.0000	- 30
Yellowfin	CN	D	21441.0000	15632.0000	- 27
Subtotal			40712.6450	30686.8300	- 25
TOTAL			107683.7000	10110.7467	- 6

[1]Site: AH = American Samoa/Hawaii; CN = Continental; PR = Puerto Rico.
[2]Source: D = Domestically-caught; I = Imports.

MARINE MAMMAL BIOLOGY PROGRAM

Aerial Survey of San Clemente and Santa Catalina Islands Summarized

During the period 1975-1978, periodic aerial surveys of pinniped species in all the Channel Islands were conducted by the Bureau of Land Management. These flights, concentrated during April-October of each year, were discontinued in 1979. The surveys were then continued (1980-1982) by Hubbs Sea World Research Institute (HSWRI), under a contract with the Air Force and NMFS. In 1983, under a contract with the Marine Sanctuary Program (NOAA), HSWRI will survey again but only the northern Channel Islands. The southern islands surveys will be conducted by NMFS with cooperation of the California Department of Fish and Game (CDF&G); four flights are planned during April-October.

Using the CDF&G's Cessna 337, a 2 hour flight was made on April 25, 1983. Larry Hansen and Charles Oliver from the La Jolla Laboratory flew as observers with CDF&G Pilot Larry Heitz. Flights were made in a clockwise direction around the islands at 500 feet altitude at a ground speed of about 100 knots. The pinnipeds sighted were photographed with a 35 mm camera equipped with a 80-260 mm zoom telephoto lens. Times of sightings, positions of sightings, and comments were recorded with a tape recorder.

Approximately 40 harbor seals were seen hauled out on San Clemente Island while 220 harbor seals were seen at Catalina Island.

Elephant Seal Pups Tagged at San Miguel Island

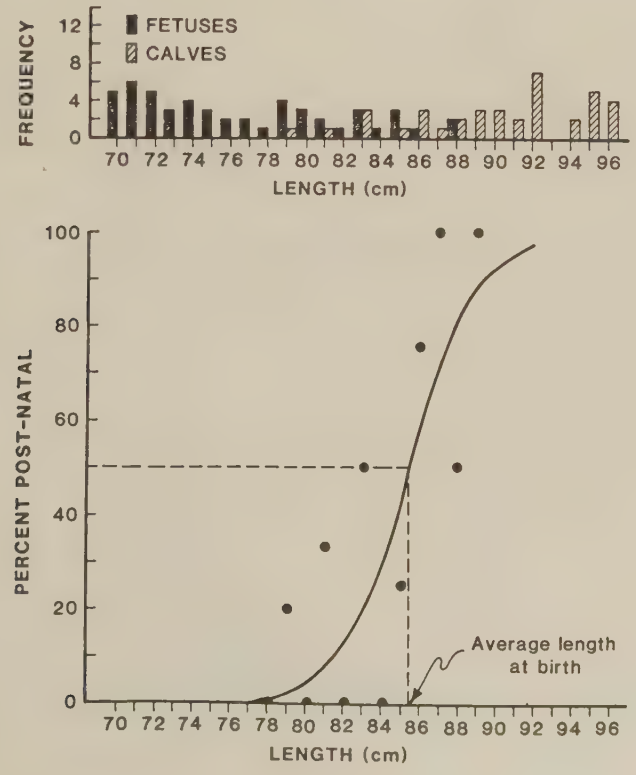
As part of a comprehensive investigation, directed by Brent Stewart of the Hubbs Sea World Research Institute conducted jointly by the SWFC and HSWRI on the population dyamics of elephant seals, investigators censused, tagged, and collected biological data from pups at San Miguel and San Nicolas Islands. Information obtained will be used to determine population trends and the size of the population relative to the level where maximum net productivity occurs.

During February 14-28, 1983, Dr. Douglas DeMaster and Chuck Oliver, of the Coastal Marine Mammal Project, at La Jolla, worked with Stewart to tag about 880 weaned pups and to take blood from 25 more. Stewart and Oliver also surveyed the entire island and counted all live, weaned pups and carcasses. They intend to estimate pup mortality from birth to weaning from carcass counts. The year's pup count was approximately 7,700, but a complete analysis of the pup mortality must be completed and added to the live-pup count before estimates of population growth can be made.

Manuscript on Growth in the First Year of the Offshore Spotted Dolphin Completed

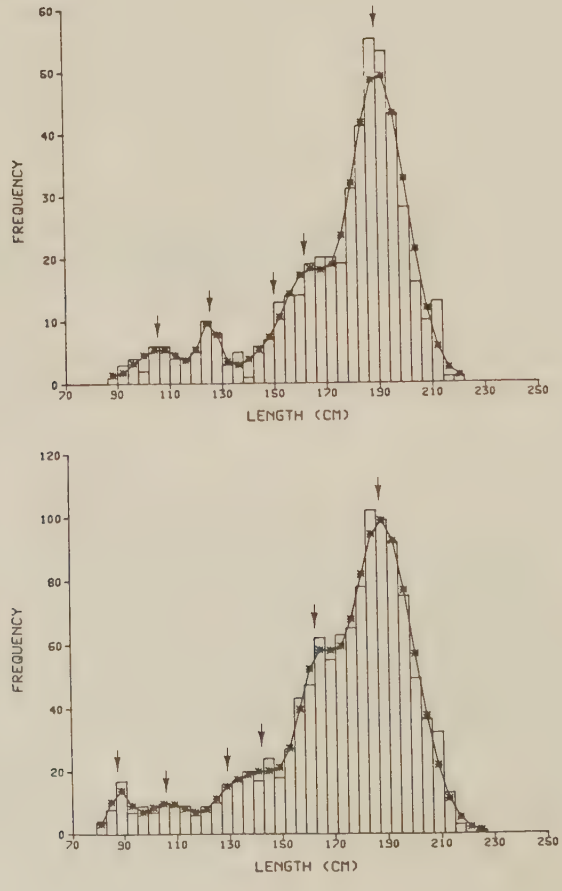
Aleta Hohn and Dr. Phil Hammond, of the Inter-American Tropical Tuna Commission have completed a manuscript on the growth in the first year of life of the offshore spotted dolphin, Stenella attenuata, in the offshore eastern tropical Pacific. The purpose of this analysis was to help verify that the correct interpretation of growth layers (GLGs) was made in the spotted dolphin teeth by comparing growth in the first year using two independent measures of growth. In addition, length at birth was estimated independently to use as the first point in the growth curves.

Length at birth was estimated by regressing percentage postnatal at each length on length, then finding the length at which 50% of the specimens in the length interval are postnatal (calves) and 50% prenatal (fetuses). The data were stratified by number of animals killed per set, since small kill sets (sets where the kill is less than 40) have about twice as many calves killed as a proportion of the total kill as in large kill sets (sets where the kill was greater than 40). The estimates of length at birth, therefore, is least biased using data only from large kill sets. A logistic curve fitted to the data from large kill sets estimated a length at birth of 85.4 cm (Figure 1).



One method of estimating growth in the first year is fitting a growth model to length on age data. Three models were fitted to the data for animals up to 3 years old: a linear model, a modification of the von Bertalanffy model, and the Gompertz model. The Gompertz model provided the best fit, with no difference in growth between males and females. The model predicted a length at one year of 123 cm.

The other method available to estimate growth in the first year is by following a progression of length distributions from month to month for all the specimens caught in the fishery for which length data is available. This method is based on the assumption that breeding in these dolphins is seasonal and that a cohort of animals born at approximately the same time can be identified as a distribution of lengths, identifiable by a mode in the overall length distribution, which can be followed from month to month as mean length of the cohort increases. The data are analyzed using a computer program (NORMSEP), which fits a specified number of normal distributions to length-frequency data (Figure 2). A growth curve can be fitted to mean length by month to give an estimated length at 1 year. The sample size for this analysis is over 15,000 animals. The analysis identified two cohorts born each year, one in the spring and one in the fall, in northern offshore spotted dolphins, with a predicted length at 1 year of 129 cm. The difference in length at 1 year between this method and that of age-length data may be due, for example, to biases in collection of the samples, variability in length at age between individuals, variability in calving season, or variability in the timing of the deposition of growth layers, all of which are considered in the paper in detail.



MULTISPECIES STOCK ASSESSMENT PROJECT

New Research Task Holds Planning Session

On May 25 and 26 the Multispecies Stock Assessment Task (TDP-12), a new research endeavor in the OFRD, held an in-house planning session. Given a goal of identifying the "capacity" of the eastern tropical Pacific relative to tuna and dolphins, the desired outcomes of the meeting were: a shared understanding of the overall goal, a list of objectives required to reach the goal, and a structure of the objectives showing relationships among them. The meeting was facilitated by David Mackett, Center Planning Officer, assisted by Susan Iacometti and Christina Show.

To achieve understanding of the overall goal and to generate a list of objectives, the Nominal Group Technique (NGT) was used. Interpretive Structural Modeling (ISM) was then employed to structure the objectives. Participating in the session were Lisa Ankenbrandt, Drs. Jay Barlow, Norm Bartoo, Andy Dizon, John Graves, Rennie Holt, Steve Reilly, Gary Sakagawa and Mr. John Hedgepath of the OFRD; Dr. Rick Methot of the CFRD, Doug Hennick of the NOAA Corps and Robert Olson of IATTC. The meeting was very successful in producing the desired outcomes, and the task's leader, Dr. Steve Reilly, is integrating the results into a proposal for long-range plans. Further "interactive" sessions will be held for operational planning to meet the key objectives identified during this meeting.

TIBURON LABORATORY

UNDERUTILIZED FISHERIES RESOURCES

FAD Construction Nearly Completed

Two fish-aggregating-devices (FADs) are being built at the Tiburon Laboratory and Honolulu Laboratory for deployment in southern California waters in June, during a cruise of the NOAA research vessel, David Starr Jordan. Some design changes, suggested by commercial fishermen who will be using the FADs, and by USCG Lt (jg) Richard Boy of the NOAA Data Buoy Center, have been made in the mooring system as well as the attracting device. Project Leader Bill Leet reports that construction of the FADs will be completed in early June and deployed off San Diego in late June, before bluefin tuna appear locally on their annual northerly migration. If the structures are effective in attracting and holding bluefin or other tunas, large savings in fuel costs may be realized by boat owners. Because of the occurrence of the El Niño phenomenon this year, however, the species and numbers of fish occurring off southern California may be quite atypical. Instead of catches of tunas by the commercial fleet, recreational fishermen may be the principal beneficiaries from the likely inclusions of yellowtail, barracuda and other warm-water sport species. Both recreational and commercial fishermen have been invited to participate in the deployment of the FADs from the Jordan.

FISH COMMUNITIES INVESTIGATION

Delay Diet Switch From Anchovy to Juvenile Rockfish

As part of an ongoing project to investigate the impact of predator-prey relationships on fisheries management, king salmon stomachs are sampled at this time of year to determine the species composition of juvenile rockfish taken as prey. Fishery biologist Peter Adams reports that at the end of May, king salmon still have not begun to feed on juvenile rockfish, continuing instead to feed on adult anchovies. This is 3 weeks later than the latest date that feeding on juvenile rockfish has begun in the past. The obvious suspicion is that the delay is related to this year's unusual oceanographic conditions. However, whether this delay is due to increased anchovy availability or decreased availability of juvenile rockfish is not known. A cruise is planned in early June on the NOAA research vessel, David Starr Jordan, to determine the distribution of juvenile rockfish and anchovies and this information should help answer the question.

PHYSIOLOGICAL ECOLOGY INVESTIGATIONS

California Fish and Game to Assume Responsibility for Striped Bass Monitoring Program

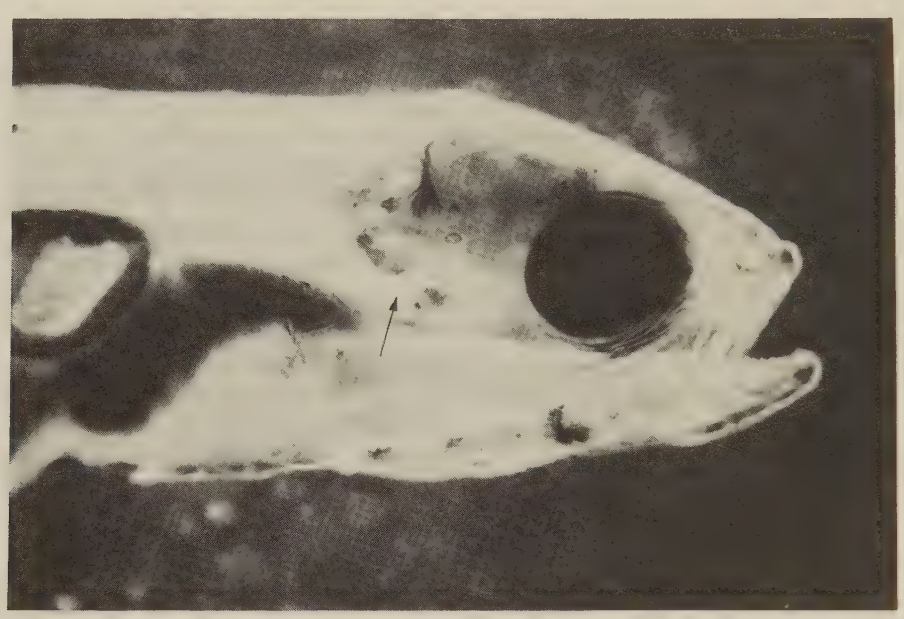
Dr. Jeanette Whipple and associates have completed training California Fish and Game personnel in procedures for monitoring the health of striped bass and they will take over the entire monitoring program next year. Dr. Whipple visited the CDF&G laboratory in Stockton, California, on May 12 to observe their procedures and to answer questions. The CDF&G personnel are completing the sampling of 40 prespawning adults--20 females and 20 males.

Among pollutant samples collected were tissues for analyses of monocyclic aromatic and alicyclic hexane hydrocarbons. NMFS research chemist Pete Benville continues to analyze these samples as in previous years. The liver and gonads from 20 adult prespawning striped bass were scanned for six monocyclic aromatics (benzene, toluene, ethylbenzene, p-xylene, m-xylene, and o-xylene) and seven alicyclic hexanes (cyclohexane, methylcyclohexane, ethylcyclohexane, and four isomers of dimethylcyclohexane-1,1; 1,2; 1,3; and 1,4). Two aromatics (toluene and o-xylene), one alicyclic (cyclohexane) have been found to date in 33% of the striped bass livers and 19% of the gonads. Concentrations ranged from .39 to .62 ppm toluene, from 4.6 to 6.6 ppm o-xylene, and from .78 to 8.7 ppm cyclohexane. Liver tissue generally had higher concentrations of these compounds. Nineteen more striped bass will be analyzed to complete this year's data collection.

Striped Bass Studied to Determine Daily Growth Ring in Otoliths

Fishery biologist Mickey Eldridge and biological technician Brian Jarvis have begun a study to determine daily growth ring development in otoliths of striped bass larvae from hatching to metamorphosis. The study is being conducted in cooperation with Lee Miller of the California Department of Fish and Game, Mike Masingill of Aquatic Systems International, and John Butler of the La Jolla Laboratory. Larvae from two different populations are being reared under a variety of conditions in order to establish the age of first increment formation and the characteristics of subsequent increment development. At the Tiburon Laboratory a new recirculating culture system is being used to rear larvae under fed and starved conditions. Temperature, salinity and photoperiod regimes are designed to simulate the normal downstream migration of larvae. Samples are taken daily for otoliths and larvae are measured for overall growth. At the same time cohort larvae are being sampled at the California Department of Fish and Game striped bass hatchery at Elk Grove, California. These larvae are identical in age but are being cultured under freshwater conditions in pond and raceways. Recent efforts by Aquatic Systems International and the Oregon Department of Fish and Wildlife have resulted in the culture of striped bass from Coos Bay, Oregon. Samples of larvae from Oregon stock are also being taken on a daily basis. These fish are reared under water conditions natural to the Coos River. For a final sample, the California Department of Fish and Game is collecting wild larvae from the San Francisco Bay/Delta estuary.

When sample collections are complete the scientists hope to determine when and under what conditions the first increment is formed and at what time intervals subsequent growth rings develop. Otolith development under these different culture conditions will be compared to find if otoliths can be characterized by their culture history. If so, this will provide a convenient and natural label for differentiating wild from hatchery fish.



Otoliths are visible in this 21-day-old striped bass larva. Otoliths must be removed from the otic capsule and examined under high magnification to determine daily growth patterns.

FISHERIES INFORMATION SYSTEMS AND AUTOMATIC DATA PROCESSING

CalFIN Update

A CalFIN meeting was held on May 17, 1983 at the Southwest Region (SWR), Terminal Island, to discuss the CalFIN project. Mel Odemar, California Department of Fish and Game (CDF&G), Eric Knaggs (CDF&G), Dick Heimann (CDF&G), Gary Smith (SWR), Svein Fougner (SWR), David Mackett (SWFC), and Fred Kellenberger (SWFC) attended the meeting to discuss the CalFIN project, the planning document, FY83 contracts, and the CalFIN FY84 budget. The Directors of the CDF&G, SWR, and SWFC recently organized a CalFIN coordinating group to coordinate and carry out long range planning for the CalFIN project. Gary Smith, Mel Odemar and Dave Mackett have been selected to participate on the committee.

John Davies, SWFC employee stationed at the SWR, reports that the 1978 California Fish and Game catch data is now on UCSD's VAX system. The related reference files are: gear, origin, port, and species. The gear, port and species files contain both the CDF&G codes and PacFIN codes. Presently the origin file contains only the coastal block codes; stored in the block codes are the latitude and longitude of the center of the block.

Several reports are available and may be accessed by executing a command module called "REPORT". The module lists a menu of reports currently available: detail catch, select catch, summary catch, survey (computes summary for selected records), and ticket (lists pertinent data of given ticket number). Associated with the REPORT module is a SERVICE module with the following options: test processing speed, reformat code files, create DATATRIEVE file, and create index data file.

WPACFIN Activities at Honolulu Laboratory Reported

David C. Hamm, Computer Systems Analyst, completed two additional WPACFIN technical memoranda for all the participating WPACFIN field offices. One memorandum describes the use of a new diagnostic and maintenance software, and the other describes the newly acquired Utility Pak #2 for use with the DB Master data bases in each field office.

In the American Samoa WPACFIN office, current data collecting and processing activities are continuing although data entry and processing of historical data have been placed on lower priority.

Hamm met with Eric Stojkovich, Pacific Data Systems (PDS) of Guam, and Kitty Simonds of the Council to develop specifications for continuing the Council's contract with the Guam Fishermen's Coop for collecting fishery data and for data processing by PDS. Amendments to the contract were agreed upon and schedules for delivery of data to WPACFIN were established. A Corvus 20MB hard disk system that will be installed at the Guam Division of Aquatic and

Wildlife Resources has been ordered. This hardware will greatly improve the data processing capabilities of the Guam WPACFIN office.

The microcomputer system for Palau has been ordered and the system will be installed at the Palau Marine Resources Division in June.

ADP Operations

Dorothy Roll, Computer Systems Analyst, reports that the reviewers in Washington, DC, have approved the following procurement requests: the Corvus hard disk for the WPACFIN project in Honolulu, a KAYPRO II portable computer for the Pacific Environmental Group (PEG), and the components for 5 La Jolla Standard microsystems and related peripherals for the La Jolla Laboratory. Currently, for approval processing review in Washington, DC, is a procurement request to purchase the components for a La Jolla Standard microsystem for the Coastal Marine Mammal project and CRT terminals for the FIN and administrative tasks in the Southwest Region.

Brenda Baker, Contract Officer in the WASC office in Seattle, has informed the SWFC that there were six vendors who submitted bids for providing the Molecular 64X and the Cyber tape drive unit. The cost spread is about 12K. The selection of the vendor will be made after clarification has been made that the vendors have the software for tape transfer and communication fully operational and will provide local maintenance.

Robert Nydam, Computer Programmer Analyst, Robert Bistodeau, Computer Technician, and Dorothy Roll met with Ben Remington, Executive Officer, and Richard Winn, Accounting Technician, on May 20, to discuss the specifications for the FY 1984 Financial Reporting System (FRS) and the scheduling of the software development for the system. Molecular has announced that the delivery of the 64X model has been shifted from June to September. This may delay the FY84 FRS start-up date, which was tentatively set for December 1. Based on the September 1 delivery of the 64X, the new target date is January 1.

Robert Nydam reports that two microcomputers were removed from the NOAA research vessel, David Starr Jordan, and installed at the La Jolla Laboratory. Both are Z-80 CP/M based systems with dual 5-1/4" disk drives. The systems are compatible with the La Jolla Standard microsystems. WordStar, the CP/M based word processing software, has been installed on both units. They will be used by Rich Charter, Data Manager in the Coastal Fisheries Resources Division, and Susan Iacometti, ADP's Computer Systems Analyst, to develop software for shipboard applications.

The SUPERCALC spreadsheet, a CP/M software, has been installed for the CRT terminal, TAB 132/15, which has a video port. This allows the software to be used with the ADP group's projector system for meetings and training sessions.

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Susan Iacometti has received the 1981 Oregon commercial catch data for the Coastwide Data System (CDS) and has successfully read the tape on UCSD's VAX computer system. She is also testing and modifying the Sort-Merge program for CDS. The 1981 California commercial catch data has been received and loaded on the VAX system. It will be accessed by John Davies, Computer Specialist assigned to the Southwest Region, for formatting according to CDS specifications.

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The microcomputer committee met on May 3. Attendees were Al Coan from OFRD, Rich Charter and Jack Brown from CFRD, Fred Kellenberger, Bob Nydam and Dorothy Roll. Kellenberger clarified the function of the Molecular Supermicro 64X system. Designated as the data management and administrative management system, it will servce as the core for the Center's word processing system and the sharing of data files between the La Jolla Standard microsystems. A prototype 68000 high speed scientific microcomputer will be assembled by Jack Brown, Electronic Engineer, to interface with the Molecular 64X.

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Attending the word processing committee meeting on May 3 were Frances Begley from OFRD, Julie Shoemaker, John Hunter, and Jack Brown from CFRD, Lorraine Prescott from TSG (Technical Support Group), Fred Kellenberger, Bob Nydam and Dorothy Roll. The hardware requirements for the two divisions and the Technical Support Group were confirmed. The system configuration consists of a La Jolla Standard microsystem for each division and TSG. OFRD will have three Concept AVT amber screened terminals linked to their La Jolla Standard; CFRD will have two, TSG will have three.

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The Environmental Data Information Service (EDIS) has provided Nelson Ross, the Liaison Officer at SWFC, with an IBM 5285 microcomputer. The unit is located in ADP's key-entry room. When not in use by Ross, it is available to SWFC staff. Sid Stillwaugh, the Seattle Liaison Officer, was at the Center May 12 and 13, to train Ross and Susan Iacometti on the use of the 5285. Iacometti participated in the training in order to assist the Center's staff in its use.

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Susan Iacometti operated the Interpretive Structural Modeling (ISM) technique for Steve Reilly's planning meeting to set objectives for TDP-12 multi-species project. During these sessions on May 25 and 26, Iacometti trained Christina Show of OFRD on ISM. Show has been selected to be the operator for OFRD's planning meetings.

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Dorothy Roll completed a 2-year term as Treasurer of the Federal ADP Council of southern California and Arizona. Susan Iacometti has been elected secretary to the Council for FY 1984. The first of three meetings will be held during the fall of 1983.

MISCELLANEOUS

HONORS AND AWARDS

Honolulu Laboratory

The following employees were nominated by the Honolulu Laboratory for the 1983 Federal Day Awards:

Dr. Robert A. Skillman, Manager of the Year
Thomas K. Kazama, Employee of the Year

All the nominees from the various Federal agencies in Honolulu will be honored at the Federal Week Luncheon on June 2, 1983. Winners of the various award categories will be announced at the luncheon.

Tiburon Laboratory

Director Norman J. Abramson of the Tiburon Laboratory presented Edmund S. Hobson, Jr. with a 25-year length of service pin. Maxwell B. Eldridge was presented with a 15-year pin.

PUBLIC AFFAIRS

Honolulu Laboratory

May 3 - Richard S. Shomura, Director, Honolulu Laboratory presented a lecture at Dr. J. Parrish's zoology class at the University of Hawaii.

La Jolla Laboratory

May 10-12 - Dr. Gary Sakagawa attended the 34th International Science and Engineering Fair in Albuquerque, New Mexico, as a judge for NOAA Awards.

16 - Nancy Lo, Statistician, gave a talk on, "Anchovy egg and larva mortality" to students in the Mathematics Department, University of California, San Diego.

Tiburon Laboratory

May 6 - Mickey Eldridge of the Tiburon Laboratory presented a laboratory tour and lecture on water pollution research to a class from Humboldt State University.

SEMINARS

La Jolla Laboratory

May 3 - Dr. S. Tanaka, Ocean Research Institute, University of Tokyo, Japan, discussed, "Variation of pelagic fish stocks in waters around Japan."

19 - Dr. Richard H. Parrish, Southwest Fisheries Center, Pacific Environmental Group presented a report on "Evidence for a fall spawning anchovy stock in California."

24 - Dr. Paul E. Smith, Southwest Fisheries Center, La Jolla, spoke on "Year class strength and survival of clupeoid fishes in the first year of life."

Tiburon Laboratory

May 17 - Todd Anderson from Moss Landing Marine Laboratory gave a talk on identification and development of juvenile rockfishes (genus Sebastes) in Central California kelp forests. The seminar was a cooperative effort of the Tiburon Center for Environmental Studies, San Francisco State University and the Tiburon Laboratory.

25 - A cooperative effort, the Tiburon Center for Environmental Studies, San Francisco State University and the Tiburon Laboratory presented a seminar with guest speaker Dr. Joseph J. Cech, Jr., Associate Professor, Department of Wildlife and Fisheries Biology, U.C. Davis who spoke on "Osmoregulation and acid-base balance in teleostean fishes: case study of the striped bass.

VISITORS

Honolulu Laboratory

May 2 - Hiromichi Yatomi of Tokai University, Shimizu, Shizuoka, Japan, arrived in Honolulu to spend a year as a visiting researcher at the Honolulu Laboratory.

3 - Rear Adm. Charles K. Townsend, Director, Pacific Marine Center, National Ocean Survey, Seattle, Washington, and Cmdr. Robert C. Rousch, Commanding Officer, NOAA Townsend Cromwell, visited Richard S. Shomura.

4 - Dr. Deetsie H. Chave, Hawaii Undersea Research Laboratory (HURL), met with Richard S. Shomura and Dr. Steven Ralston.

11 - Kitty Simonds of the Western Pacific Fisheries Council met with Richard S. Shomura.

12 - Stan Kaneshiro, Chief, Honolulu Satellite Office, Western Administrative Service Center (WASC); Christopher Jay, Honolulu Area Personnel Representative, WASC; and Kelly C. Sandy, Director, WASC, Seattle, Washington, visited Richard Shomura.

24 - Ben Remington, SWFC, spoke to program leaders, activity chiefs, and interested employees on the Financial Reporting System and other subjects.

25-27 - Dr. John V. Byrne, William G. Gordon, Dr. Izadore Barrett, Director, and John F. Carr, Deputy Director, SWFC, La Jolla, were in Honolulu to attend the NWHI symposium.

La Jolla Laboratory

May 2 - Mr. Boris Ramirez, Chief, Department of Fishery Economics, General Directorate of Marine Resources, Ministry of Commerce and Industry, Republic of Panama and 1983 Eisenhower Exchange Fellow from Panama.

3 - Dr. S. Tanaka, Ocean Research Institute, University of Tokyo.

6 - Pat Montanio, Permits and Documentation Branch, Office of Protected Species and Habitat Conservation, NMFS, Washington, DC.

12 - Abdullah Ali Bakathir, Director-General of Fisheries of the Ministry of Agriculture and Fisheries, Sultanate of Oman and Anjab Sajwani, Project Officer, Joint U.S./Oman Commission. Messrs. Bakathir and Sajwani were here to learn how U.S. resources are utilized and how NMFS laboratories and regions contribute to U.S. fisheries and research management efforts. The visitors were hosted here by Dr. Reuben Lasker, Acting Center Director and Mr. David Mackett, Planning Officer.

13 - Fishery Oceanographer Alfredo Selas, Mexican/Japanese Joint Venture Co., Copemapro, SA de C.V., met with Jim Squire and David Au to discuss requirements for biological and stock assessment data to be collected from joint venture longliners.

May 26-June 3 - Dr. Alexander Christakis at the Center to attend the Workshop on Long Range Planning for the North Pacific Albacore Fishery.

27 - Clayton Terry and Helen Beasley, Field Finance Office, WASC, Seattle, Washington.

Moroccan Delegation Visits La Jolla

A first for the National Marine Fisheries Service, Southwest Fisheries Center was the visit of His Excellency H.E. Bensalem Smili, Minister of Maritime Fisheries and Merchant Marine of the Government of the Kingdom of Morocco and senior officials of his Ministry to the United States which was sponsored by the Government of the United States. The host and program coordinator was the Department of Commerce, National Oceanographic and Atmospheric Administration. Program arrangements were made by the National Marine Fisheries Service. Minister Smili was accompanied by a large Moroccan delegation of business people interested in U.S.-Moroccan cooperation in the marine fisheries sector.

According to Abdelkader Lahlou, Director of International Legal and Training Affairs for Morocco and an interpreter for the group, the Moroccan goals in respect to fisheries are to provide additional food and employment for the people of Morocco, increase foreign exchange, and conserve the living resources in the 200-mile exclusive economic zone of Morocco.

The fisheries research group in Morocco, Institute Scientifique des Peches Maritimes (ISPM), is located in Casablanca. ISPM is within the Office National de Peche (ONP), which is in the new Ministry of Marine Fisheries and Merchant Marine, headed by Dr. Bensalem Smili. ISPM is interested in fish stock assessment, aquaculture, environmental assessment, seafood handling and processing; fishing gear development and aquarium operation.

Among the visits arranged by the Center for Dr. Smili during his 3-day visit to this area was one to the Scripps Institution of Oceanography on May 6. Shown in the accompanying photograph is from left: Admiral Justin E. Langille, Associate Director of Scripps, Dr. Smili, signing the SIO guest book, unidentified member of Moroccan delegation, and Mr. Lahlou.

Admiral Langille points out a specimen of flatfish from Scripps' extensive reference collection to Dr. Smili when Mr. Lahlou looks on.

SWFC Staff Hosts Eminent Japanese Fishery Scientist

Gathered to welcome their distinguished guest at the entrance to the SWFC are Drs. John Hunter, Fishery Biologist, Izadore Barrett, SWFC Director, Gary Sakagawa, Leader of the Oceanic Fisheries Resources Division, S. Tanaka, Ocean Research Institute, University of Tokyo, and Dr. Reuben Lasker, Leader of the Coastal Fisheries Resources Division. Dr. Tanaka presented a seminar during his visit and held discussions with SWFC fishery scientist.

Tiburon Laboratory

May 4 - Cory Daniel, Texas Instruments, San Francisco, California.

9 - Boris Ramirez, Ministry of Commerce and Industry, Republic of Panama, Panama.

- Sam Pooley, Honolulu Laboratory, Honolulu, Hawaii.

13 - Abdulla Bakathir, D.G. of Fishery, Oman. Ministry of Agriculture and Fisheries, Muscat, Oman.

- Anjab Sajwani, Omani-American Joint Commission, Mutrah, Oman.

- Robert Pata, NOAA, NMFS, San Francisco, California.

23-26 - El Balderson, Ruben Enriquez, Bruce Pedersen, Inspector General's Office, Washington, DC.

24 - Clayton Terry and Helen Beasley, NOAA, NMFS, Seattle, Washington.

25 - Ben Remington, SWFC, La Jolla, California.

- J.J. Cech, Wildlife and Fisheries Biology, U.C. Davis, Davis, California.

- Dave Thomas, Bernice Hammer, Tom Jow, Mel Odemar, Richard Heimann and Eric Knaggs of California Department of Fish and Game and Svein Fougner of NMFS Southwest Region to attend meeting of PacFIN Groundfish Data Subcommittee.

Visiting Foreign Dignitaries at the Tiburon Laboratory

Tiburon Laboratory hosted the Omani Fisheries Delegation which was in this country from May 7 to May 22. The delegation was comprised of Abdullah Ali Bakathir, Director-General of Fisheries of the Ministry of Agriculture and Fisheries, Sultanate of Oman and Anjab Sajwani, Project Officer, Joint U.S.-Omani Commission. Mr. Sajwani was translator for Mr. Bakathir.

On May 9 Boris Ramirez, Fisheries Economist, Directorate of Marine Resources, Ministry of Commerce and Industry of Panama visited the laboratory to discuss methods and success of developing underutilized fisheries. He was particularly interested in the utilization of shark flesh and the costs associated with packaging, preserving and transportation.

MEETINGS AND TRAVEL

Honolulu Laboratory

May 4 - Richard S. Shomura, Dr. Jeffrey J. Polovina, Richard N. Uchida, and James H. Uchiyama attended the meeting of the Coordinating Council for Research--Northwestern Hawaiian Islands.

6-17 - Samuel G. Pooley traveled to California for meetings at the Tiburon Laboratory and the La Jolla Laboratory.

14-18 - Richard S. Shomura and Dr. Richard W. Brill traveled to California to attend the Lake Arrowhead Tuna Conference.

19 - Richard S. Shomura participated in a NWHI symposium planning meeting at the Marine Science Building, University of Hawaii.

23-24 - Richard S. Shomura and Samuel G. Pooley participated in the meetings of the Council at the Ala Moana Hotel.

May 30-June 3 - Dr. Jerry A. Wetherall attended the North Pacific Albacore Strategic Planning Workshop at SWFC La Jolla.

La Jolla Laboratory

May 2-6 - Dr. Angeles Alvariño traveled to CICESE, Ensenada, Mexico, where she presented lectures, helped train graduate students, and assisted in developing programs for plankton research.

5 - Izadore Barrett traveled to Terminal Island, California, to attend Regional Director Alan Ford's farewell luncheon.

8-13 - Ben Remington traveled to Washington, DC, to attend a workshop on A-76 procedures.

8-14 - Larry Hansen was at sea aboard the R/V Kelp Bass to participate in a cooperative marine mammal/fisheries interaction investigation with the California Department of Fish and Game.

9-11 - Dan Huppert traveled to Seattle, Washington, to attend PFMC and SSC meetings.

9-12 - Izadore Barrett traveled to Seattle, Washington, to attend PFMC and SSC meetings.

10-11 - Alec MacCall traveled to Seattle, Washington, to attend Pacific Fishery Management Council and SSC meetings to present the 2nd draft of the Anchovy Plan.

10-12 - Gary Sakagawa traveled to Albuquerque, New Mexico, to attend the 34th International Science and Engineering Fair as a judge for NOAA Awards.

12-16 - Charles Oliver traveled to San Clemente Island, California, to continue studies on pinnipeds.

15-18 - Lisa Ankenbrandt, Jay Barlow, Norm Bartoo, John Carr, Andrew Dizon, Ron Dotson, Dave Holts, Pierre Kleiber, Ron Rinaldo, and John Hedgepeth traveled to Lake Arrowhead, California, to attend the 34th Annual Tuna Conference.

15-19 - Jack Brown traveled to Anaheim, California, to attend the National Computer Conference.

16-17 - Izadore Barrett traveled to Lake Arrowhead, California to attend the 34th Annual Tuna Conference.

16-18 - Reuben Lasker traveled to Miami, Florida, to attend a Tropical Ocean and General Atmosphere (TOGA) meeting.

- Mike Laurs traveled to Lake Arrowhead, California, to attend the 34th Annual Tuna Conference.

- John Hunter traveled to Lake Wilderness, Washington, to attend a workshop on interannual variability of the environment and fisheries of the Gulf of Alaska and the eastern Bering Sea.

17 - Dave Mackett and Fred Kellenberger traveled to Terminal Island, California, to attend a CalFIN meeting.

18-20 - Izadore Barrett traveled to Mexico City, Mexico, to meet with INP Director, Jorge Carranza for discussions on cooperative research arrangements.

19-20 - Reuben Lasker traveled to Davis, California, to present a paper at a Sea Grant meeting.

22-28 - Charles Oliver traveled to Seattle, Washington, to meet with National Marine Mammal Laboratory staff on pinnipeds.

23-26 - Ben Remington traveled to Honolulu, Hawaii, to discuss administrative and financial matters with staff members.

24-27 - Izadore Barrett and John Carr traveled to Honolulu, Hawaii, to attend the Northwest Hawaiian Islands Symposium.

May 31-June 2 - Gary Sakagawa traveled to Washington, DC, to attend planning meeting on porpoise-tuna management.

May 31-June 16 - Fred Kellenberger will travel to Washington, DC, to be Acting Director of the Office of Data and Information Management; and attend MMDL meeting.

Tiburon Laboratory

May 4 - Ed Ueber traveled to San Francisco, California, to participate in a meeting of the Sea Grant Advisory Committee which is reviewing applications for Marine Advisor in the San Francisco area.

- Sharon Mooreland traveled to Humboldt State University to confer with university personnel on rockfish identifications.

5-11 - Sus Kato traveled to southern California, where he 1) conferred with LT(jg) Richard Boy and SW Region personnel re: the FAD project; 2) attended a shark conference sponsored by the Southern California Academy of Sciences; 3) conferred with fish processors in Los Angeles, Santa Barbara, and Monterey on various fishery problems; 4) obtained information and photographs needed for publications being prepared on underutilized species and sea urchins.

15-16 - Ed Ueber traveled to La Jolla, California, and attended the semi-annual meeting of SWR and SWC economists at SWFC.

19 - Ed Ueber traveled to Sacramento, California, to attend a meeting sponsored by SWR, on NMFS financial assistance programs.

23-27 - Ted Hobson traveled to Honolulu, Hawaii to participate in a Symposium on the Northwestern Hawaiian Islands.

25 - The PacFIN Groundfish Data Subcommittee met at the Tiburon Laboratory to dicuss groundfish data flow. Bill Lenarz, Ed Ueber and Norman Abramson attended the meeting.

PERSONNEL ACTIONS

Honolulu Laboratory

May 3 - Gail A. Peiterson, Biological Technician - Extension of Temporary Appointment.

15 - Daniel R. Locey, Computer Science Student Trainee (NOAA Jr. Fellow) - Return to Duty and Promotion.

- Miriam B. Pillos, Biological Science and Student Trainee (NOAA Jr. Fellow) - Return to Duty and Promotion.

- Todd T. Kassman, Computer Clerk - Temporary, Part-Time Appointment.

27 - Scot H. Hamaguchi, Biological Aid (Fisheries) - Full-Time Temporary Appointment.

- Daniel A. Mahar, Biological Aid (Fisheries) - Full-Time Temporary Appointment.

La Jolla Laboratory

May 1 - Priscilla Sloan, Fishery Biologist - Reassignment.

2 - Michael Henry, Biological Technician - Termination.

4 - James Cotton, Biological Technician - Termination.

5 - Robert Pitman, Biological Technician - Termination.

8 - Carol Miller, Computer Programmer - Reappointment.

12 - Sandor Kaupp, Biological Technician - Termination.

13 - Martha Brown, Writer - Resignation.

18 - Tom Polacheck, Fishery Biologist - Reappointment.

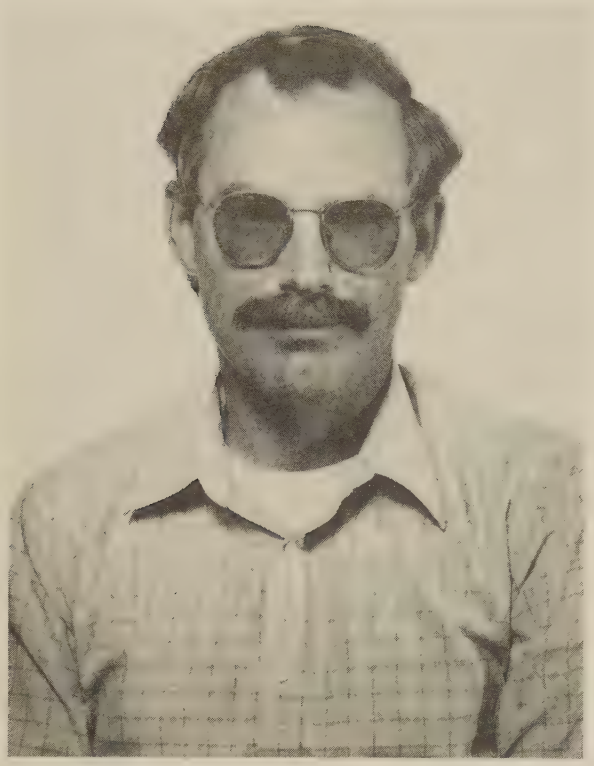
19 - Victorio Gorospe, Biological Aid - Extension of Appointment.

* * * * * * * * * *

To acquaint our staff with "new" faces at the Southwest Fisheries Center, it has been our practice to present photographs of employees who most recently entered on duty: Shown in alphabetical order are:

Frances R. Begley, Secretary
Oceanic Fisheries Resources Division
Entered on Duty, August 8, 1982.

Pierre Kleiber, Fishery Biologist
Oceanic Fisheries Resources Division
Entered on duty, April 11, 1982.

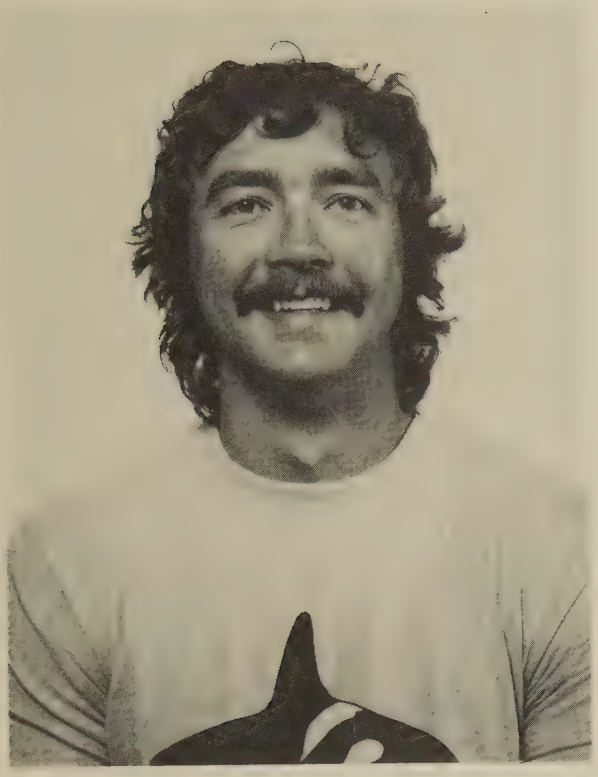


Alec D. MacCall, Fishery Biologist
Coastal Fisheries Resources Division
Entered on duty, October 1, 1982.

Esperanza Manaligod, Clerk-Typist
Administrative Section
Entered on duty, November 22, 1982.

Christine Show, Computer Systems Programmer
Automatic Data Processing Section
Entered on duty, February 14, 1982.

Owen Stiles, Cash and Attendance Clerk
Administrative Section
Entered on duty, March 23, 1983.



Thomas S. Tumosa, Biological Technician
Oceanic Fisheries Resources Division
Entered on duty, February 20, 1983

Richard Winn, Budget and Accounting Technician
Administrative Section
Entered on duty, November 26, 1982

Tiburon Laboratory

May 1 - Susan Logan, Biological Aid, Conversion to Excepted Appointment.

15 Tina Echeverria, Fishery Biologist (Research), Promotion.

TRAINING

Tiburon Laboratory

May 24-27 - Katherine A. Payne; Temporary Duty Allowances, GSA.

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